PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2003-109764

(43)Date of publication of application : 11.04.2003

(51)Int.Cl. H05B 33/14
C09K 11/06

(21)Application number : 2001-300547

(22)Date of filing : 28.09.2001

(71)Applicant : CANON INC

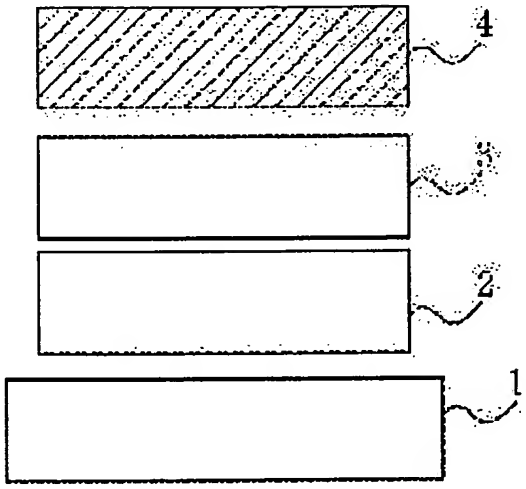
(72)Inventor : SUZUKI KOICHI
SENOO AKIHIRO

(54) ORGANIC LIGHT EMITTING ELEMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an organic light emitting element taking on various hues, giving light of high brightness at low impressed voltage, and excellent in durability.

SOLUTION: At least one of the layers consisting of organic compounds contains a condensation polycyclic compound of a specific structure.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

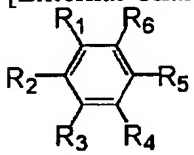
[Date of extinction of right]

* NOTICES *

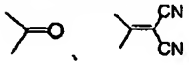
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

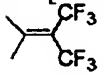
[Claim(s)]
[Claim 1] The organic light emitting device characterized by the thing of the condensed multi-ring compound in which at least one layer of the layers containing said organic compound is shown by the following general formula [I] in the organic light emitting device which has at least the layer which consists of an electrode of a couple which consists of an anode plate and cathode, and 1 or two or more organic compounds which were pinched by inter-electrode [of this couple] for which a kind is contained at least.
General formula [I]
[External Character 1]



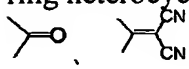
(R1, R2, R3, R4, R5, and R6 express among a formula the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / the heterocycle radical which is not permuted / the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or /, a permutation, or / a permutation, or].) Even if R1, R2, R3, R4, R5, and R6 are the same, they may differ. However, at least two, R1, R2, R3, R4, R5, and R6, express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or /, a permutation, or], and at least one of these condensed multi-ring aromatic series radicals or the condensed multi-ring heterocycle radicals is [External Character 2].



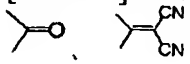
Or [External Character 3]

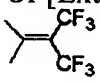


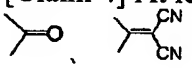
The condensed multi-ring radical which **** is expressed.
[Claim 2] At least three, R1, R2, R3, R4, R5, and R6, of a general formula [I] are the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or /, a permutation, or], and at least one of these condensed multi-ring aromatic series radicals or the condensed multi-ring heterocycle radicals is [External Character 4].

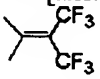


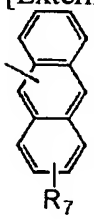
Or [External Character 5]

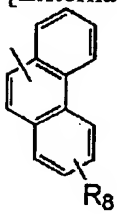
The organic light emitting device according to claim 1 which is the condensed multi-ring radical which ****.
[Claim 3] At least two, R1, R2, R3, R4, R5, and R6, of a general formula [I] are [External Character 6].


Or [External Character 7]


The organic light emitting device according to claim 1 which is the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / the permutation which ****, or /, a permutation, or].
[Claim 4] At least three, R1, R2, R3, R4, R5, and R6, of a general formula [I] are [External Character 8].


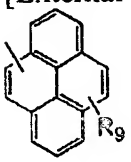
Or [External Character 9]


The organic light emitting device according to claim 3 which is the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / the permutation which ****, or /, a permutation, or].
[Claim 5] The organic light emitting device according to claim 1 or 2 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [II].
General formula [II]
[External Character 10]


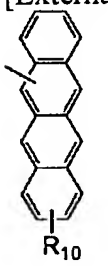
(R7 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.)
[Claim 6] The organic light emitting device according to claim 1 or 2 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [III].
General formula [III]
[External Character 11]


(R8 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.)

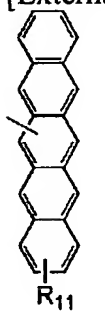
[Claim 7] The organic light emitting device according to claim 1 or 2 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [IV].
General formula [IV]
[External Character 12]



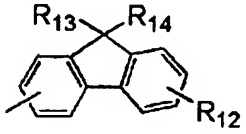
(R9 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.)
[Claim 8] The organic light emitting device according to claim 1 or 2 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [V].
General formula [V]
[External Character 13]



(R10 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.)
[Claim 9] The organic light emitting device according to claim 1 or 2 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [VI].
General formula [VI]
[External Character 14]



(R11 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.)
[Claim 10] The organic light emitting device according to claim 1 or 2 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [VII].
General formula [VII]
[External Character 15]

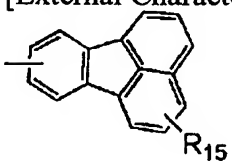


(R12 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) R13 and R14 express the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / an alkyl group, a permutation, or /, a permutation, or /, a permutation, or].

[Claim 11] The organic light emitting device according to claim 1 or 2 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [VIII].

General formula [VIII]

[External Character 16]

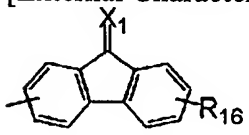


(R15 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.)

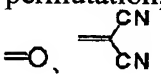
[Claim 12] The organic light emitting device according to claim 1 to 4 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [IX].

General formula [IX]

[External Character 17]



(R16 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) X1 is [External Character 18].



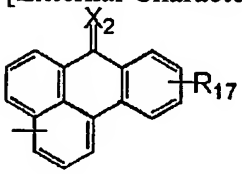
Or [External Character 19]

****

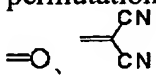
[Claim 13] The organic light emitting device according to claim 1 to 4 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [X].

General formula [X]

[External Character 20]



(R17 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) X2 is [External Character 21].



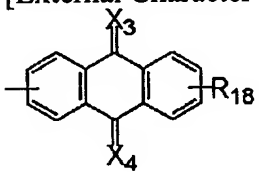
Or [External Character 22]

********.

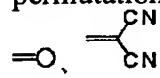
[Claim 14] The organic light emitting device according to claim 1 to 4 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [XI].

General formula [XI]

[External Character 23]



(R18 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) X3 and X4 are [External Character 24].



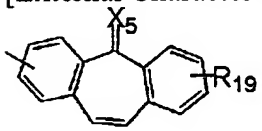
Or [External Character 25]

********. Even if X3 and X4 are the same, they may differ.

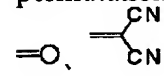
[Claim 15] The organic light emitting device according to claim 1 to 4 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [XII].

General formula [XII]

[External Character 26]



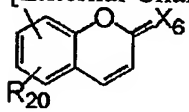
(R19 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) X5 is [External Character 27].



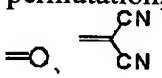
Or [External Character 28]

********.

[Claim 16] The organic light emitting device according to claim 1 to 4 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring heterocycle radical shown by the following general formula [XIII].
General formula [XIII]
[External Character 29]



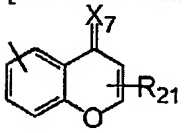
(R20 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) X6 is [External Character 30].



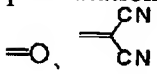
Or [External Character 31]

****

[Claim 17] The organic light emitting device according to claim 1 to 4 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring heterocycle radical shown by the following general formula [XIV].
General formula [XIV]
[External Character 32]



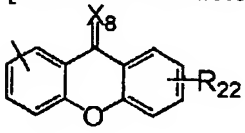
(R21 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) X7 is [External Character 33].



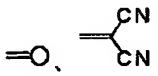
Or [External Character 34]

****

[Claim 18] The organic light emitting device according to claim 1 to 4 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring heterocycle radical shown by the following general formula [XV].
General formula [XV]
[External Character 35]



(R22 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) X8 is [External Character 36].



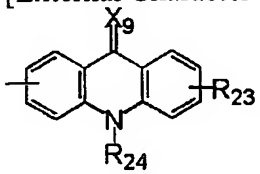
Or [External Character 37]

********.

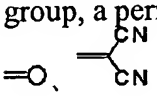
[Claim 19] The organic light emitting device according to claim 1 to 4 whose R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring heterocycle radical shown by the following general formula [XVI].

General formula [XVI]

[External Character 38]



(R23 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) R24 expresses the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or]. X9 is [External Character 39].



Or [External Character 40]

********.

[Claim 20] The organic light emitting device according to claim 1 to 4 to which an electronic transporting bed is characterized by the thing of the condensed multi-ring compound shown by the general formula [I] for which a kind is contained at least at least among the layers which consist of an organic compound.

[Claim 21] The organic light emitting device according to claim 1 to 4 to which a luminous layer is characterized by the thing of the condensed multi-ring compound shown by the general formula [I] for which a kind is contained at least at least among the layers which consist of an organic compound.

[Translation done.]

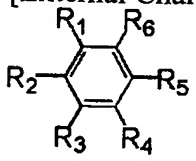
* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

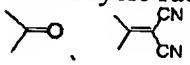
DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the organic light emitting device using a new organic compound and new it.
[0002]
[Description of the Prior Art] An organic light emitting device is a component using the light emitted in case the exciton of a fluorescence compound is made to generate and this exciton returns to a ground state by making the thin film containing a fluorescence organic compound pinch, and pouring in an electron and a hole (electron hole) from each electrode between an anode plate and cathode.
[0003] In about [10V] applied voltage, luminescence of about [1000cds //m] two is reported by the component of the functional discrete-type two-layer configuration which used ITO for the anode plate, used the alloy of magnesium silver for cathode in research (Appl.Phys.Lett.51,913 (1987)) of KODAKKU in 1987, respectively, and used the triphenylamine derivative for the hole transport ingredient, using an aluminum quinolinol complex as an electronic transport ingredient and a luminescent material. As a patent of relation, U.S. Pat. No. 4, No. 539 or 507, U.S. Pat. No. 4,720,432, a U.S. Pat. No. 4,885,211 number, etc. are mentioned.
[0004] Moreover, by changing the class of fluorescence organic compound, luminescence from ultraviolet to infrared rays is possible, and, recently, research of various compounds is done actively. For example, it is indicated by a U.S. Pat. No. 5,151,629 number, a U.S. Pat. No. 5,409,783 number, a U.S. Pat. No. 5,382,477 number, JP,2-247278,A, JP,3-255190,A, JP,5-202356,A, JP,9-202878,A, JP,9-227576,A, etc.
[0005] Furthermore, the organic light emitting device which used the conjugated-system giant molecule other than an organic light emitting device using the above low-molecular ingredients is reported by the group (Nature, 347,539 (1990)) of Cambridge University. By this report, luminescence is checked by the monolayer by forming polyphenylene vinylene (PPV) by the coating system.
[0006] As a related patent of the organic light emitting device using a conjugated-system macromolecule, a U.S. Pat. No. 5,247,190 number, a U.S. Pat. No. 5,514,878 number, a U.S. Pat. No. 5,672,678 number, JP,4-145192,A, JP,5-247460,A, etc. are mentioned.
[0007] Thus, the latest advance in an organic light emitting device is remarkable, and the description has suggested the possibility from the versatility of high brightness and luminescence wavelength, high-speed responsibility, a thin shape, and the lightweight formation of a luminescence device being possible to an extensive application with low applied voltage.
[0008] However, the optical output or high conversion efficiency of the further high brightness is required of the actual condition. Moreover, there are still many problems in respect of endurance, such as degradation by an ambient atmosphere gas, moisture, etc. containing aging and oxygen by activity of long duration. Although luminescence of blue with the sufficient color purity at the time of furthermore considering the application to a full color display etc., green, and red is needed, still, it is not enough about these problems.
[0009] As a fluorescence organic compound used for an electronic transporting bed, a luminous layer, etc., many aromatic compounds and condensed multi-ring aromatic compounds are studied. For example, although JP,4-68076,A, JP,5-32966,A, JP,6-228552,A, JP,6-240244,A, JP,7-109454,A, JP,8-311442,A, JP,9-241629,A, JP,2000-26334,A,

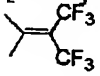
JP,2000-268964,A, etc. are mentioned, what luminescence brightness and endurance can fully satisfy is not obtained.
[0010]
[Problem(s) to be Solved by the Invention] a condensed multi-ring compound [**** / this invention] -- using -- very -- efficient -- high -- it is in offering the organic light emitting device which has a brightness optical output. Moreover, it is in offering an extremely durable organic light emitting device. It is in offering the organic light emitting device which manufacture can furthermore create comparatively cheaply easily.
[0011]
[Means for Solving the Problem] Therefore, this invention offers the organic light emitting device characterized by the thing of the condensed multi-ring compound in which at least one layer of the layers containing said organic compound is shown by the following general formula [I] for which a kind is contained at least in the organic light emitting device which has at least the layer which consists of an electrode of a couple which consists of an anode plate and cathode, and 1 or two or more organic compounds which were pinched by inter-electrode [of this couple].
[0012] General formula [I]
[External Character 41]



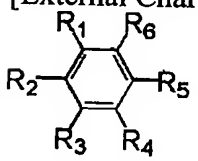
[0013] (R1, R2, R3, R4, R5, and R6 express among a formula the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / the heterocycle radical which is not permuted / the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or /, a permutation, or / a permutation, or].) Even if R1, R2, R3, R4, R5, and R6 are the same, they may differ.
[0014] However, at least two, R1, R2, R3, R4, R5, and R6, express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or /, a permutation, or], and at least one of these condensed multi-ring aromatic series radicals or the condensed multi-ring heterocycle radicals is [External Character 42].



[0015] Or [External Character 43]



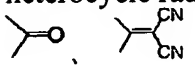
[0016] The condensed multi-ring radical which **** is expressed.
[0017]
[Embodiment of the Invention] The organic light emitting device of this invention is characterized by the thing of the condensed multi-ring compound in which at least one layer of the layers containing said organic compound is shown by the following general formula [I] for which a kind is contained at least in the organic light emitting device which has at least the layer which consists of an electrode of a couple which consists of an anode plate and cathode, and 1 or two or more organic compounds which were pinched by inter-electrode [of this couple].
[0018] General formula [I]
[External Character 44]



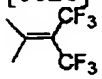
[0019] (R1, R2, R3, R4, R5, and R6 express among a formula the condensed multi-ring heterocycle radical which is

not permuted [the condensed multi-ring aromatic series radical which is not permuted / the heterocycle radical which is not permuted / the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or /, a permutation, or / a permutation, or].) Even if R1, R2, R3, R4, R5, and R6 are the same, they may differ.

[0020] However, at least two, R1, R2, R3, R4, R5, and R6, express the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or /, a permutation, or], and at least one of these condensed multi-ring aromatic series radicals or the condensed multi-ring heterocycle radicals is [External Character 45].

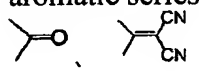


[0021] Or [External Character 46]

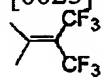


[0022] The condensed multi-ring radical which **** is expressed.

For the organic light emitting device of this invention, at least three, R1, R2, R3, R4, R5, and R6, of a general formula [I] are the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / a permutation or / a permutation, or], and at least one of these condensed multi-ring aromatic series radicals or the condensed multi-ring heterocycle radicals is [External Character 47].

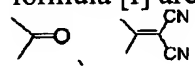


[0023] Or [External Character 48]

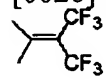


[0024] It is desirable that it is the condensed multi-ring radical which ****.

[0025] For the organic light emitting device of this invention, at least two, R1, R2, R3, R4, R5, and R6, of a general formula [I] are [External Character 49].

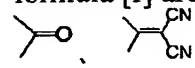


[0026] Or [External Character 50]

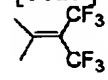


[0027] It is desirable that it is the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / the permutation which ****, or /, a permutation, or].

[0028] For the organic light emitting device of this invention, at least three, R1, R2, R3, R4, R5, and R6, of a general formula [I] are [External Character 51].



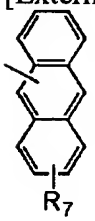
[0029] Or [External Character 52]



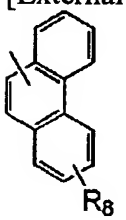
[0030] It is desirable that it is the condensed multi-ring heterocycle radical which is not permuted [the condensed multi-ring aromatic series radical which is not permuted / the permutation which ****, or /, a permutation, or].

[0031] As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [II].

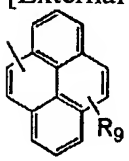
[0032] General formula [II]
[External Character 53]



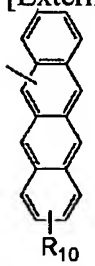
[0033] (R7 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.)
As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [III].
[0034] General formula [III]
[External Character 54]



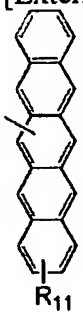
[0035] (R8 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.)
As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [IV].
[0036] General formula [IV]
[External Character 55]



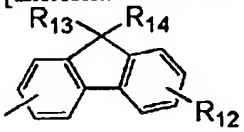
[0037] (R9 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.)
As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [V].
[0038] General formula [V]
[External Character 56]



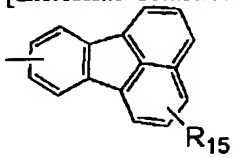
[0039] (R10 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.)
As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [VI].
[0040] General formula [VI]
[External Character 57]



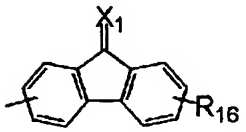
[0041] (R11 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.)
As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [VII].
[0042] General formula [VII]
[External Character 58]



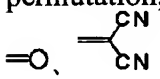
[0043] (R12 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) R13 and R14 express the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / an alkyl group, a permutation, or /, a permutation, or /, a permutation, or].
As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [VIII].
[0044] General formula [VIII]
[External Character 59]



[0045] (R15 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.)
As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [IX].
[0046] General formula [IX]
[External Character 60]

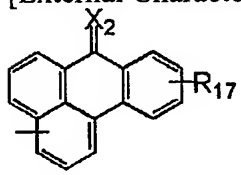


[0047] (R16 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) X1 is [External Character 61].

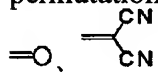


[0048] Or [External Character 62]

[0049]) ********.
As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [X].
[0050] General formula [X]
[External Character 63]

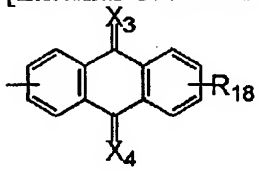


[0051] (R17 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) X2 is [External Character 64].

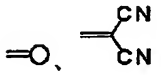


[0052] Or [External Character 65]

[0053]) ********.
As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [XI].
[0054] General formula [XI]
[External Character 66]

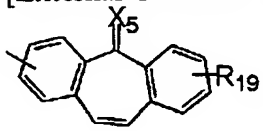


[0055] (R18 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) X3 and X4 are [External Character 67].

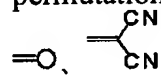


[0056] Or [External Character 68]

[0057] ********. Even if X3 and X4 are the same, they may differ.
As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring aromatic series radical shown by the following general formula [XII].
[0058] General formula [XII]
[External Character 69]

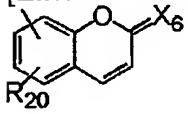


[0059] (R19 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) X5 is [External Character 70].

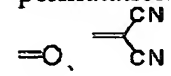


[0060] Or [External Character 71]

[0061]) ********.
As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring heterocycle radical shown by the following general formula [XIII].
[0062] General formula [XIII]
[External Character 72]

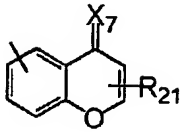


[0063] (R20 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) X6 is [External Character 73].

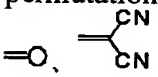


[0064] Or [External Character 74]

[0065]) ********.
As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring heterocycle radical shown by the following general formula [XIV].
[0066] General formula [XIV]
[External Character 75]



[0067] (R21 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) X7 is [External Character 76].



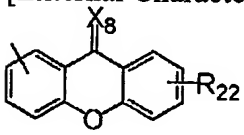
[0068] Or [External Character 77]

[0069]) ********.

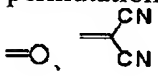
As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring heterocycle radical shown by the following general formula [XV].

[0070] General formula [XV]

[External Character 78]



[0071] (R22 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) X8 is [External Character 79].



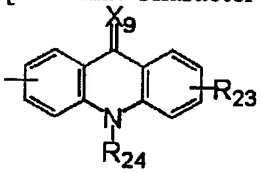
[0072] Or [External Character 80]

[0073]) ********.

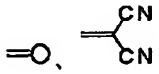
As for the organic light emitting device of this invention, it is desirable that R1, R2, R3, R4, R5, or R6 of a general formula [I] are the condensed multi-ring heterocycle radical shown by the following general formula [XVI].

[0074] General formula [XVI]

[External Character 81]



[0075] (R23 expresses among a formula the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or], the permutation amino group, or a cyano group.) R24 expresses the heterocycle radical which is not permuted [the aryl group which is not permuted / the aralkyl radical which is not permuted / a hydrogen atom, an alkyl group, a permutation, or /, a permutation, or /, a permutation, or]. X9 is [External Character 82].



[0076] Or [External Character 83]

[0077]) ********.

The organic light emitting device of this invention has at least the desirable thing of the condensed multi-ring compound in which an electronic transporting bed is shown by the general formula [I] for which a kind is contained at least among the layers which consist of an organic compound.

[0078] The organic light emitting device of this invention has at least the desirable thing of the condensed multi-ring compound in which a luminous layer is shown by the general formula [I] for which a kind is contained at least among the layers which consist of an organic compound.

[0079]

[Embodiment of the Invention] The example of the substituent in the above-mentioned general formula [I] - a general formula [XVI] is shown below.

[0080] As an alkyl group, a methyl group, an ethyl group, n-propyl group, an iso-propyl group, n-butyl, ter-butyl, an octyl radical, etc. are mentioned.

[0081] Benzyl, a phenethyl radical, etc. are mentioned as an aralkyl radical.

[0082] As an aryl group, a phenyl group, a biphenyl radical, a terphenyl radical, a styryl radical, etc. are mentioned.

[0083] As a heterocycle radical, a thienyl group, a pyrrolyl radical, a pyridyl radical, an oxazolyl radical, an oxadiazolyl radical, a thiazolyl radical, a thiadiazolyl radical, a TACHI enyl radical, a TAPIRORIRU radical, etc. are mentioned.

[0084] As a condensed multi-ring aromatic series radical, a naphthyl group, a fluorenyl group, an anthryl radical, a phenan thrill radical, a fluoran thenyl radical, a pyrenyl radical, a tetra-SENIRU radical, a pen TASENIRU radical, a peri RENIRU radical, a TORIFE elm nil radical, etc. are mentioned.

[0085] As a condensed multi-ring heterocycle radical, a quinolyl radical, a carbazolyl radical, an AKURIJIRIRU radical, a phenan TORORIRU radical, etc. are mentioned.

[0086] As a permutation amino group, a dimethylamino radical, a diethylamino radical, a dibenzylamino radical, a diphenylamino radical, a ditolylamino radical, the JIANISORIRU amino group, a JURORIJIRU radical, etc. are mentioned.

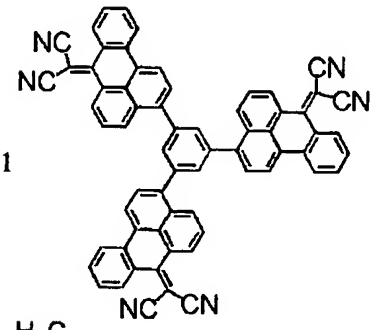
[0087] As a substituent which the above-mentioned substituent may have, alkyl groups, such as a methyl group, an ethyl group, and a propyl group, Aralkyl radicals, such as benzyl and a phenethyl radical, a phenyl group, a biphenyl radical, Aryl groups, such as a terphenyl radical and a styryl radical, a thienyl group, a pyrrolyl radical, A pyridyl radical, an oxazolyl radical, an oxadiazolyl radical, a thiazolyl radical, Heterocycle radicals, such as a thiadiazolyl radical, a TACHI enyl radical, and a TAPIRORIRU radical, A naphthyl group, a fluorenyl group, an anthryl radical, a phenan thrill radical, a fluoran thenyl radical, Condensed multi-ring aromatic series radicals, such as a pyrenyl radical, a tetra-SENIRU radical, a pen TASENIRU radical, a peri RENIRU radical, and a TORIFE elm nil radical, Condensed multi-ring heterocycle radicals, such as a quinolyl radical, a carbazolyl radical, an AKURIJIRIRU radical, and a phenan TORORIRU radical, A dimethylamino radical, a diethylamino radical, a dibenzylamino radical, a diphenylamino radical, Alkoxyl groups, such as permutation amino groups, such as a ditolylamino radical, a JIANISORIRU amino group, and a JURORIJIRU radical, a methoxyl group, ethoxyl, propoxyl, and a phenoxyl radical, a cyano group, etc. are mentioned.

[0088] Next, although the example of representation of the condensed multi-ring compound of this invention is given to below, this invention is not limited to these.

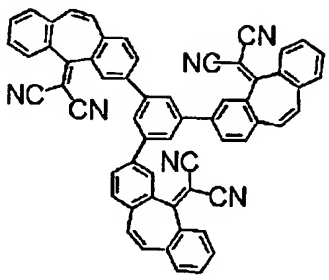
[0089] [The example of a compound of this operation gestalt]

[External Character 84]

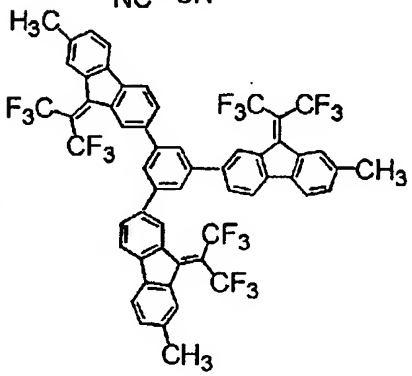
1



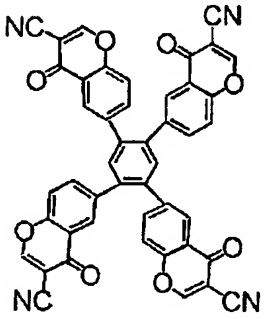
4



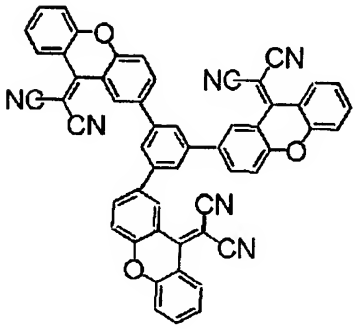
2



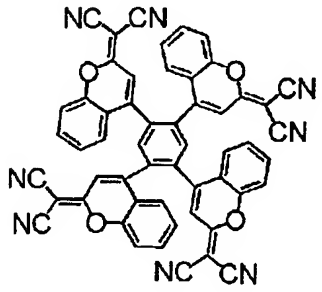
5



3

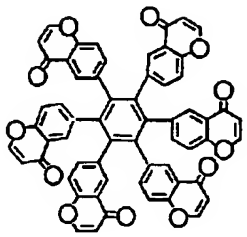


6

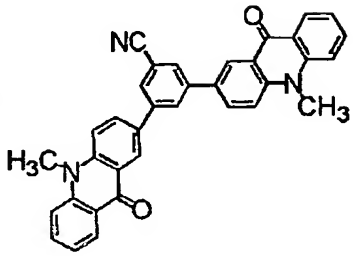


[0090]
[External Character 85]

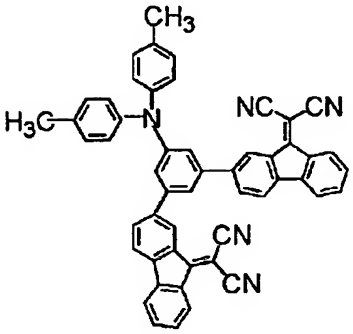
7



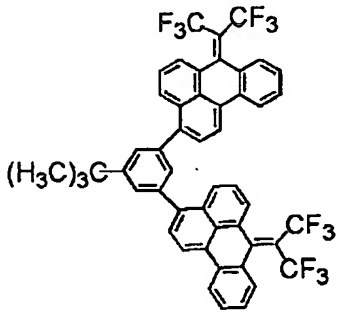
10



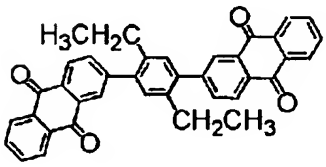
8



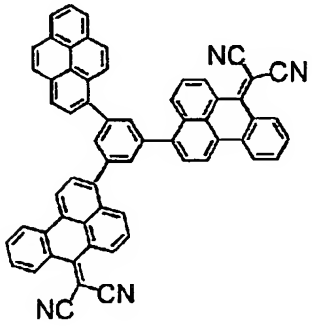
11



9

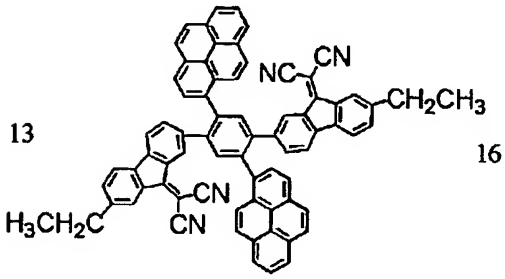


12

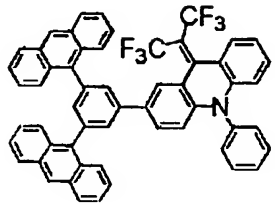


[0091]
[External Character 86]

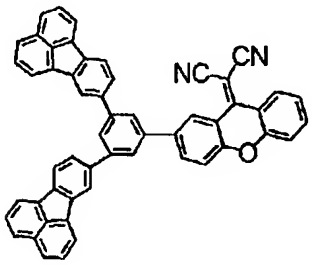
13



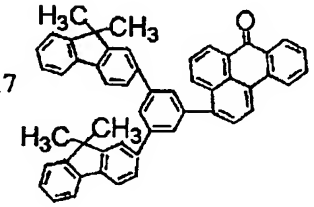
16



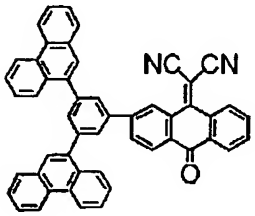
14



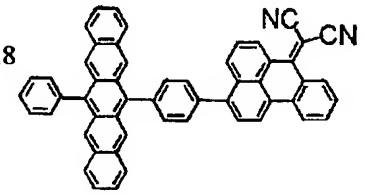
17



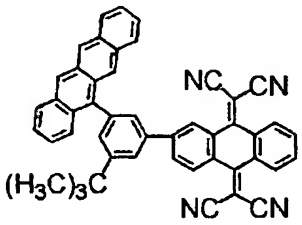
15

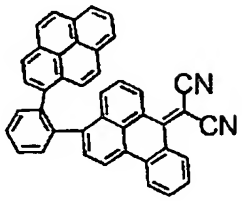


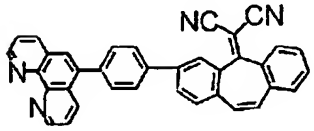
18

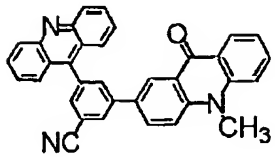


[0092]
[External Character 87]

19 

22 

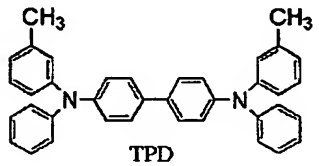
20 

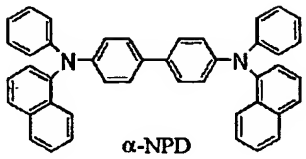
21 

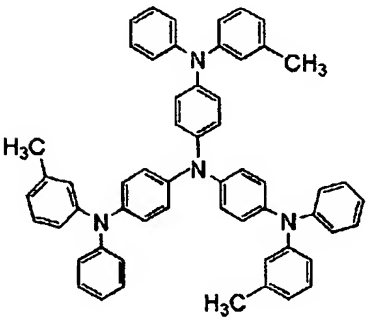
[0093] Suzuki can compound the condensed multi-ring compound of this invention by the approach generally learned, for example, using the palladium catalyst coupling -- Yamamoto using law (95 for example, Chem.Rev.1995, 2457) and a nickel catalyst -- it can obtain with synthesis methods, such as law (for example, Bull.Chem.Soc.Jpn, 51, 2091, 1978) and the approach (for example, J.Org.Chem., 52, 4296, 1987) of compounding using an aryl tin compound.
[0094] Moreover, the condensed multi-ring compound of this invention is Angew.Chem.Int.Ed.Engl., 31, 1101 and 1992, and Tetrahedron. Lett., 38, 1081 and 1997, and Tetrahedron It is compoundable to Lett., 40, 8625, 1999, etc. by the well-known approach of a publication.
[0095] The condensed multi-ring compound shown by the general formula [I] of this invention is a compound which was excellent in electronic transportability, the luminescence, and endurance compared with the conventional compound, it is useful as an electronic transporting bed and a luminous layer especially, and the layer containing the organic compound of an organic light emitting device and the layer formed by the vacuum deposition method, the solution applying method, etc. are [that crystallization etc. cannot take place easily] excellent in stability with the passage of time.
[0096] Next, the organic light emitting device of this invention is explained to a detail.
[0097] The organic light emitting device of this invention is characterized by the thing of the condensed multi-ring compound in which at least one layer of the layers containing said organic compound is shown by the general formula [I] for which a kind is contained at least in the organic light emitting device which has at least a layer containing the electrode of a couple which consists of an anode plate and cathode, and 1 or two or more organic compounds which were ****(ed) by inter-electrode [of this couple].
[0098] The organic light emitting device of this invention has at least the desirable thing of said condensed multi-ring compound for which an electronic transporting bed or a luminous layer contains a kind at least among the layers containing an organic compound.
[0099] In the organic light emitting device of this invention, the condensed multi-ring compound shown by the above-mentioned general formula [I] is formed between an anode plate and cathode by the vacuum deposition method or the solution applying method. The thickness of the organic layer is thinner than 10 micrometers, and it is preferably desirable to thin-film-ize in thickness of 0.01-0.5 micrometers more preferably 0.5 micrometers or less.

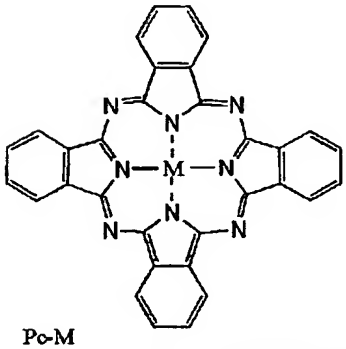
[0100] An example with the organic desirable light emitting device of this invention is shown in drawing 1 - drawing 6 .
[0101] Drawing 1 is the sectional view showing an example of the organic light emitting device of this invention. Drawing 1 is the thing of a configuration of having formed an anode plate 2, a luminous layer 3, and cathode 4 one by one on the substrate 1. The light emitting device used here is useful, when it is single and has hole transport ability, electron transport ability, and the luminescent engine performance by itself, or when mixing and using the compound which has each property.
[0102] Drawing 2 is the sectional view showing other examples in the organic light emitting device of this invention. Drawing 2 is the thing of a configuration of having formed an anode plate 2, the hole transporting bed 5, the electronic transporting bed 6, and cathode 4 one by one on the substrate 1. in this case, photogene -- hole transportability -- or any of electronic transportability -- or it is useful, when using for each layer the ingredient which has both functions and using combining the mere hole transport matter or the electronic transport matter without the luminescence. Moreover, a luminous layer 3 consists in this case of either the hole transporting bed 5 or the electronic transporting bed 6.
[0103] Drawing 3 is the sectional view showing other examples in the organic light emitting device of this invention. Drawing 3 is the thing of a configuration of having formed an anode plate 2, the hole transporting bed 5, a luminous layer 3, the electronic transporting bed 6, and cathode 4 one by one on the substrate 1. Since the various compounds which differ in luminescence wavelength can be used while this separating the function of carrier transport and luminescence, and combining it hole transportability, electronic transportability, a compound with each luminescent property, and timely, using it and its degree of freedom of ingredient selection increasing extremely, diversification of a luminescent color phase is attained.
[0104] Furthermore, it also becomes possible to confine each carrier or an exciton in a central luminous layer effectively, and to aim at improvement in luminous efficiency.
[0105] Drawing 4 is the sectional view showing other examples in the organic light emitting device of this invention. It is the configuration which inserted the hole impregnation layer 7 in the anode plate side to drawing 3 , and drawing 4 has effectiveness in the adhesion improvement of an anode plate and a hole transporting bed, or an injectional improvement of a hole, and is effective for low-battery-izing.
[0106] Drawing 5 and drawing 6 are the sectional views showing other examples in the organic light emitting device of this invention. Drawing 5 and drawing 6 receive drawing 3 and drawing 4 . It is the configuration which inserted the layer (hole blocking layer 8) which checks escaping from a hole or an exciton (exciton) to a cathode side between the luminous layer and the electronic transporting bed. By using the very high compound of ionization potential as a hole blocking layer 8, it is a configuration effective for improvement in luminous efficiency.
[0107] However, drawing 1 - drawing 6 are to the last very fundamental component configurations, and the configuration of the organic light emitting device using the compound of this invention is not limited to these. For example, the glue line or interference layer which prepares an insulating layer in an electrode and an organic layer interface is prepared. A hole transporting bed consists of two-layer [from which ionization potential differs]. **** -- various lamination can be taken.
[0108] The condensed multi-ring compound shown by the general formula [I] used for this invention is a compound which was excellent in electronic transportability, the luminescence, and endurance compared with the conventional compound, and can be used with any gestalt of drawing 1 - drawing 6 .
[0109] Especially the organic layer using the condensed multi-ring compound of this invention is useful as an electronic transporting bed and a luminous layer, and the layer formed by the vacuum deposition method, the solution applying method, etc. is [that crystallization etc. cannot take place easily] excellent in stability with the passage of time.
[0110] Although the condensed multi-ring compound shown by the general formula [I] as a constituent of an electronic transporting bed and a luminous layer is used for this invention, a hole transportability compound, a luminescent compound, or an electronic transportability compound known until now can also be used for it together if needed.
[0111] These examples of a compound are given to below.
[0112] Hole transportability compound [outside 88]

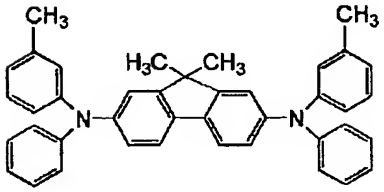
表１　ホール輸送性化合物

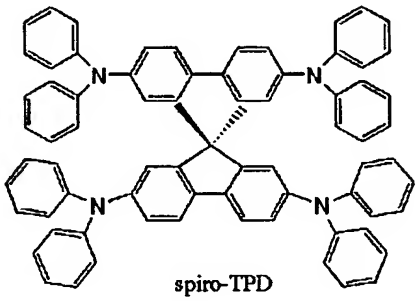

TPD

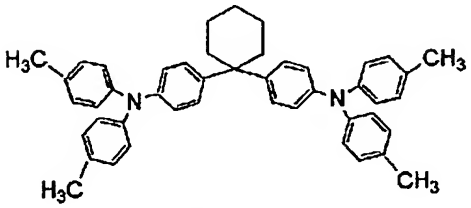

α-NPD

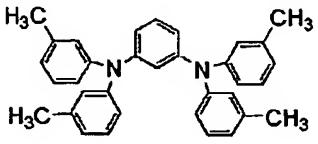

m-MTDATA


Pc-M
M : Cu, Mg, AlCl, TiO, SiCl2, Zn , Sn, MnCl, GaCl, etc

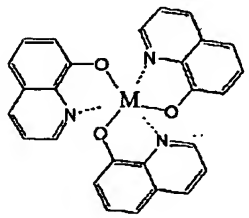

DTDPFL


spiro-TPD

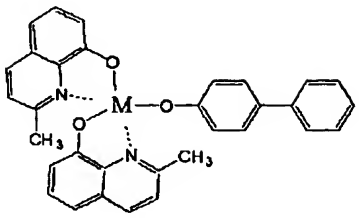

TPAC


PDA

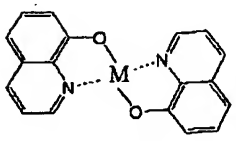
[0113] Electronic transportability luminescent material [outside 89]



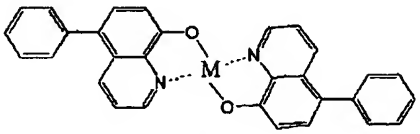
M : Al , Ga



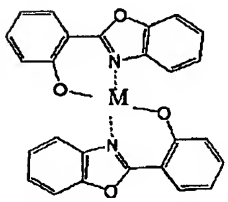
M : Al , Ga



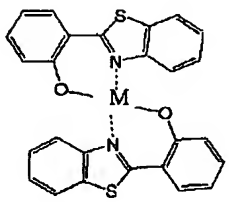
M : Zn , Mg , Be



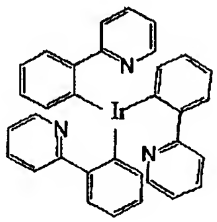
M : Zn , Mg , Be

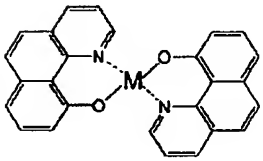


M : Zn , Mg , Be

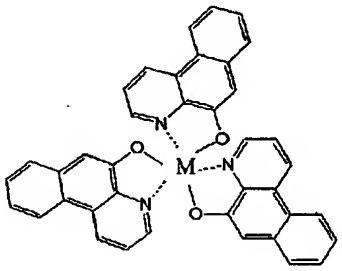


M : Zn , Mg , Be



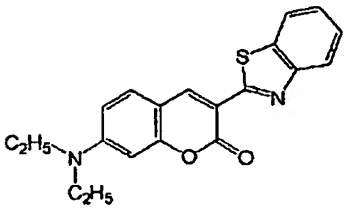


M : Zn , Mg , Be

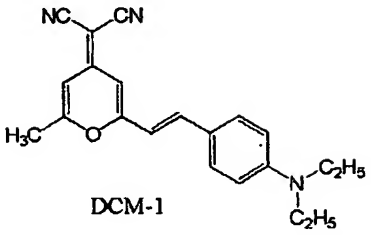


M : Al , Ga

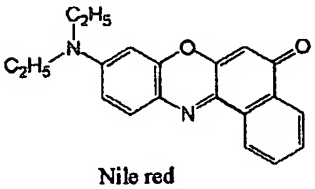
[0114] Luminescent material [outside 90]



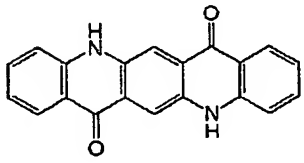
Coumarin6



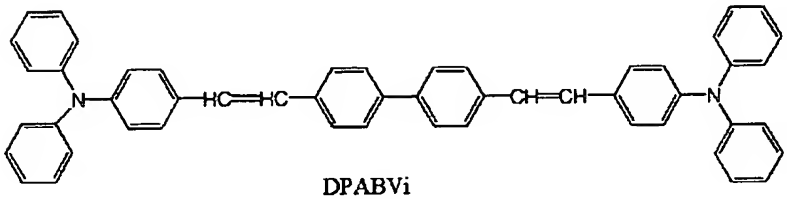
DCM-1



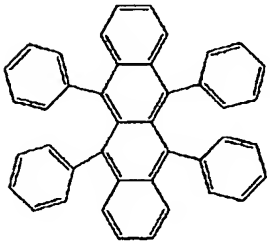
Nile red



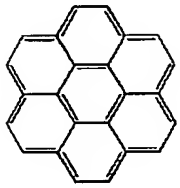
Quinacridone



DPABVi



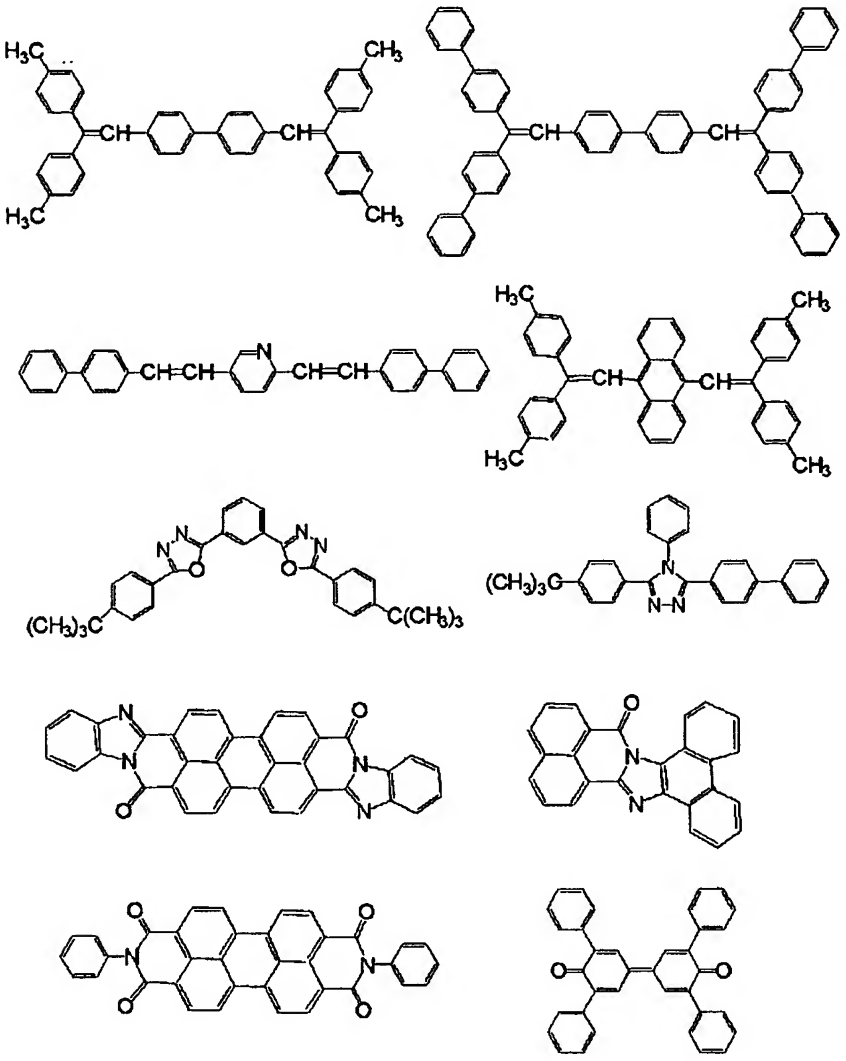
Rubrene



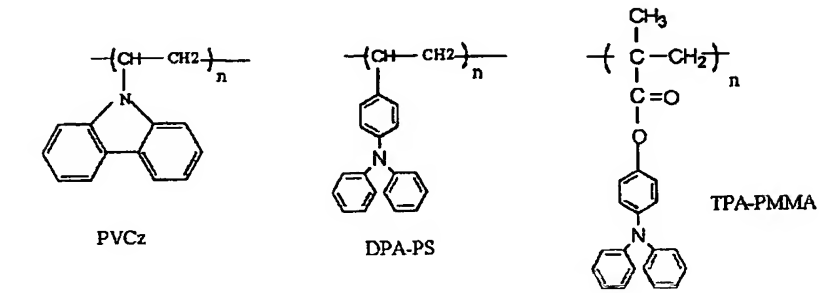
Coronene

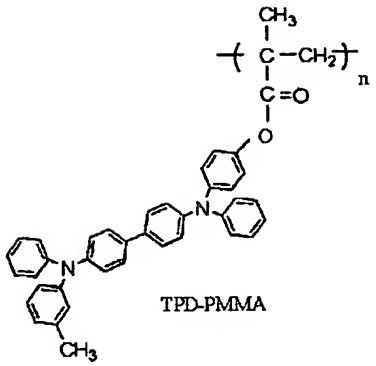
[0115] A luminous layer matrix material and an electronic transport ingredient [outside 91]

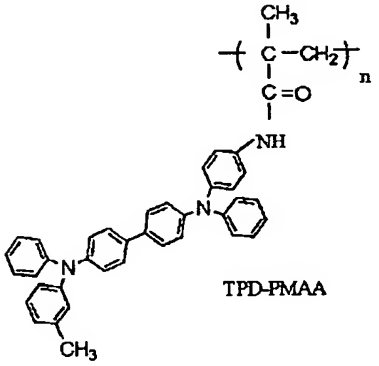
表４　発光層マトリックス材料および電子輸送材料

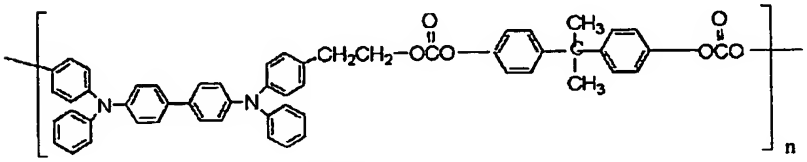


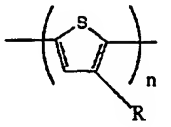
[0116] Polymer system hole transportability ingredient [outside 92]



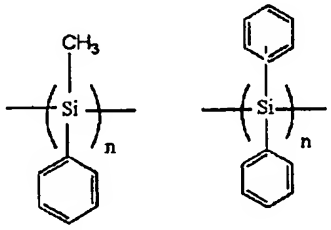






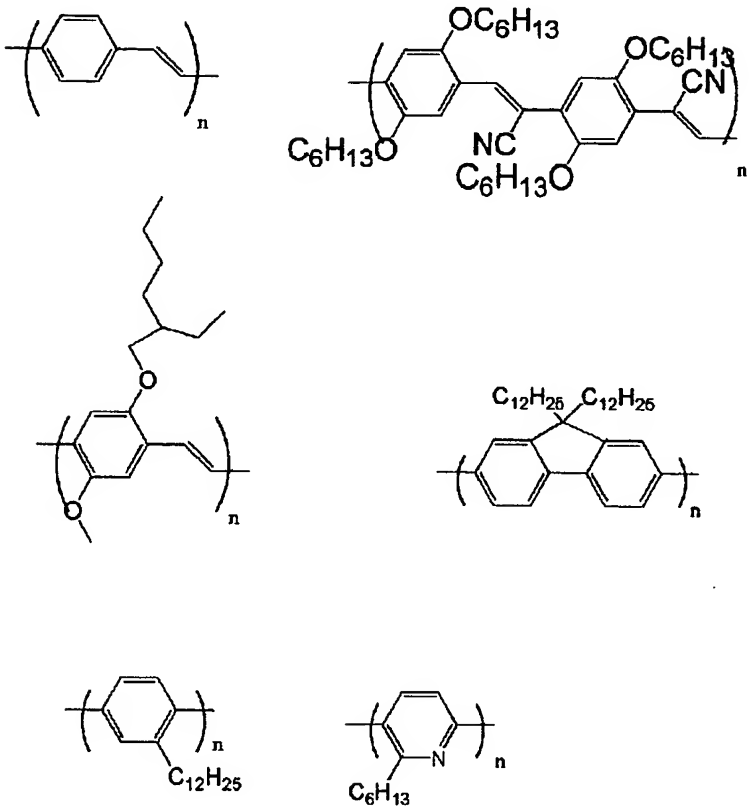


Poly thiophene



Poly silicone

[0117] Polymer system luminescent material and a charge transportability ingredient [outside 93]



[0118] In the organic light emitting device of this invention, generally, it is made to dissolve in a vacuum deposition method or a suitable solvent, and the layer containing the layer containing the condensed multi-ring compound shown by the general formula [I] and other organic compounds forms a thin film by the applying method. When forming membranes especially by the applying method, the film can also be formed combining suitable binding resin.
[0119] Although it can choose from bending resin wide range as the above-mentioned binding resin, for example, polyvinyl-carbazole resin, polycarbonate resin, polyester resin, polyarylate resin, polystyrene resin, acrylic resin, methacrylic resin, butyral resin, polyvinyl-acetal resin, diallyl phthalate resin, phenol resin, an epoxy resin, silicone resin, polysulfone resin, a urea-resin, etc. are mentioned, it is not limited to these. moreover -- as that these are independent or a copolymer polymer -- one sort -- or two or more sorts may be mixed.
[0120] What has as big a work function as an anode material as possible is good, for example, metallic oxides, such as metal simple substances, such as gold, platinum, nickel, palladium, cobalt, a selenium, and vanadium, or these alloys, tin oxide, a zinc oxide, a tin oxide indium (ITO), and a zinc oxide indium, can be used. Moreover, conductive polymers, such as the poly aniline, polypyrrole, the poly thiophene, and a polyphenylene sulfide, can also be used. Such electrode material may be used independently and can also be used together. [two or more]
[0121] On the other hand, as a cathode material, the small thing of a work function is good and can use as a metal simple substance or two or more alloys, such as a lithium, sodium, a potassium, calcium, magnesium, aluminum, an indium, silver, lead, tin, and chromium. Utilization of metal oxidation, such as a tin oxide indium (ITO), is also possible. Moreover, a configuration is much more sufficient as cathode, and it can also take a multilayer configuration.
[0122] Especially as a substrate used by this invention, although it does not limit, transparency substrates, such as opaque substrates, such as a metal substrate and a substrate made from the ceramics, glass, a quartz, and a plastic sheet, are used. Moreover, it is also possible to use the light filter film, the fluorescence color conversion filter film, the dielectric reflective film, etc. for a substrate, and to control coloring light.
[0123] In addition, to the created component, a protective layer or a closure layer can also be prepared in order to prevent contact with oxygen, moisture, etc. As a protective layer, a photo-setting resin etc. is mentioned to poly membrane pans, such as inorganic material film, such as a diamond thin film, a metallic oxide, and a metal nitride, fluorine resin, poly paraxylene, polyethylene, silicone resin, and polystyrene resin. Moreover, glass, a gas impermeable

film, a metal, etc. can be covered and packaging of the component itself can also be carried out with suitable closure resin.

[0124]

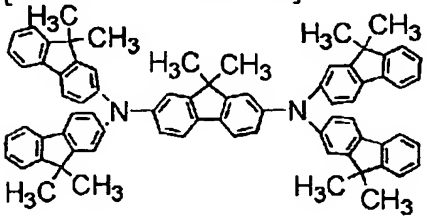
[Example] Hereafter, although the example explains this invention still more concretely, this invention is not limited to these.

[0125] The component of the structure shown in [example 1] drawing 2 was created.

[0126] On the glass substrate as a substrate 1, what formed the tin oxide indium (ITO) as an anode plate 2 by 120nm thickness in the spatter was used as a transparent conductive support substrate. Sequential ultrasonic cleaning of this was carried out by the acetone and isopropyl alcohol (IPA), and, subsequently it dried after boiling washing by IPA. Furthermore, what carried out UV / ozone washing was used as a transparent conductive support substrate.

[0127] On the transparent conductive support substrate, the chloroform solution of the compound shown with the following structure expression was formed by 30nm thickness with the spin coat method, and the hole transporting bed 5 was formed.

[External Character 94]



[0128] The condensed multi-ring compound furthermore shown by instantiation compound No.1 was formed by 40nm thickness with the vacuum deposition method, and the electronic transporting bed 6 was formed. The degree of vacuum at the time of vacuum evaporationo formed 1.0x10 to 4 Pa, and a membrane formation rate on condition that 0.2 - 0.3 nm/sec.

[0129] Next, the metal layer membrane with a thickness of 150nm was formed with the vacuum deposition method on the above-mentioned organic layer as cathode 4 using the vacuum evaporationo ingredient which consists of aluminum and a lithium (lithium concentration 1 atom %). The degree of vacuum at the time of vacuum evaporationo formed 1.0x10 to 4 Pa, and a membrane formation rate on condition that 1.0 - 1.2 nm/sec.

[0130] Thus, when the ITO electrode (anode plate 2) was used the obtained component, the positive electrode and the aluminum-Li electrode (cathode 4) were used as the negative electrode and the direct current voltage of 8V was impressed, the current flowed for the component with the current density of 7.7 mA/cm2, and orange luminescence by the brightness of 3200 cd/m2 was observed.

[0131] Furthermore, when current density was maintained at 5.0 mA/cm2 under nitrogen-gas-atmosphere mind and the electrical potential difference was impressed for 100 hours, 1500 cds/m2, and brightness degradation were small 100 hours after initial brightness 1600 cd/m2.

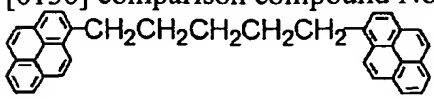
[0132] Replaced with [examples 2-10] instantiation compound No.1, and instantiation compound No.3, and 4, 7, 8, 11, 14, 16, 19 and 22 were used, and also the component was created like the example 1, and same assessment was performed.

[0133] A result is shown in a table -1.

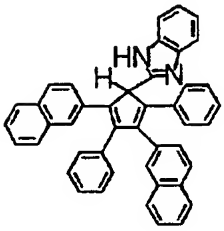
[0134] It replaced with [examples 1-6 of comparison] instantiation compound No.1, and the compound shown with the following structure expression was used, and also the component was created like the example 1, and same assessment was performed.

[0135] A result is shown in a table -1.

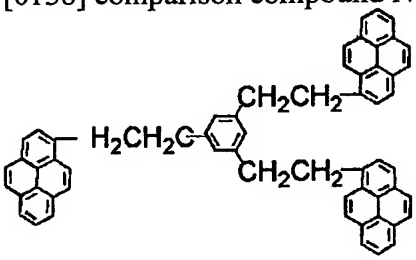
[0136] comparison compound No.1 -- [External Character 95]



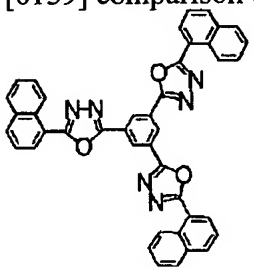
[0137] comparison compound No.2 -- [External Character 96]



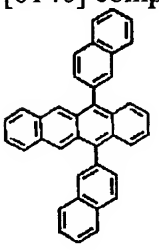
[0138] comparison compound No.3 -- [External Character 97]



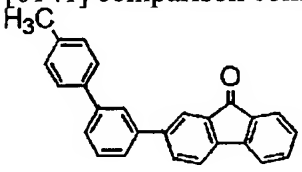
[0139] comparison compound No.4 -- [External Character 98]



[0140] comparison compound No.5 -- [External Character 99]



[0141] comparison compound No.6 -- [External Character 100]



[0142]
[A table 1]

表－1

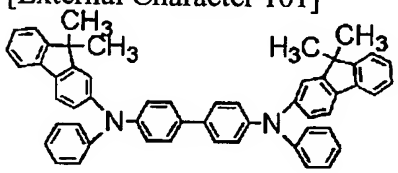
例No.	例示化合物No.	初期 印加電圧 (V)	初期 輝度 (cd/m²)	耐久 (電流密度) 5.0 mA/cm²	初期 輝度 (cd/m²)	100時間後 輝度 (cd/m²)
実施例1	1	8	3200		1600	1500
2	3	8	2900		1400	1200
3	4	8	3600		2000	1800
4	7	8	1900		950	850
5	8	8	3300		1900	1600
6	11	8	2400		1100	1000
7	14	8	1800		1000	900
8	16	8	2100		1200	1000
9	19	8	1600		1000	800
10	22	8	2200		1400	1200
比較例1	比較1	8	120		70	発光せず
2	比較2	8	300		210	50
3	比較3	8	170		90	発光せず
4	比較4	8	250		130	発光せず
5	比較5	8	400		280	100
6	比較6	8	130		90	発光せず

[0143] The component of the structure shown in [example 11] drawing 3 was created.
[0144] The hole transporting bed 5 was formed on the transparent conductive support substrate like the example 1.
[0145] Furthermore, aluminum tris quinolinol was formed by 20nm thickness with the vacuum deposition method, and the luminous layer 3 was formed. The degree of vacuum at the time of vacuum evaporationo formed 1.0x10 to 4 Pa, and a membrane formation rate on condition that 0.2 - 0.3 nm/sec.
[0146] The condensed multi-ring compound furthermore shown by instantiation compound No.1 was formed by 40nm thickness with the vacuum deposition method, and the electronic transporting bed 6 was formed. The degree of vacuum at the time of vacuum evaporationo formed 1.0x10 to 4 Pa, and a membrane formation rate on condition that 0.2 - 0.3 nm/sec.
[0147] Next, the metal layer membrane with a thickness of 150nm was formed with the vacuum deposition method on the above-mentioned organic layer as cathode 4 using the vacuum evaporationo ingredient which consists of aluminum and a lithium (lithium concentration 1 atom %), and the component of the structure shown in drawing 3 was created. Degree of vacuum at the time of vacuum evaporationo 1.0x10 to 4 Pa, and membrane formation rate Membranes were formed on condition that 1.0 - 1.2 nm/sec.
[0148] Thus, when the ITO electrode (anode plate 2) was used the obtained component, the positive electrode and the aluminum-Li electrode (cathode 4) were used as the negative electrode and the direct current voltage of 8V was impressed, the current flowed for the component with the current density of 8.9 mA/cm2, and green luminescence was observed by the brightness of 7800 cd/m2.
[0149] Furthermore, when current density was maintained at 7.0 mA/cm2 under nitrogen-gas-atmosphere mind and the electrical potential difference was impressed for 100 hours, 5400 cds/m2, and brightness degradation were small 100 hours after initial brightness 5800 cd/m2.
[0150] Replaced with [examples 12-20] instantiation compound No.1, and instantiation compound No.3, and 5, 6, 9, 10, 12, 13, 18 and 20 were used, and also the component was created like the example 11, and same assessment was performed.
[0151] A result is shown in a table -2.
[0152] Replaced with [examples 7-12 of comparison] instantiation compound No.1, and comparison compound No.1, and 2, 3, 4, 5 and 6 were used, and also the component was created like the example 11, and same assessment was performed.
[0153] A result is shown in a table -2.
[0154]
[A table 2]

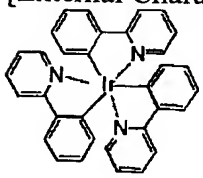
表－2

例No.	例示化合物No.	初期印加電圧 (V)	輝度 (cd/m^2)	耐久 (電流密度) 7.0 mA/cm^2	初期輝度 (cd/m^2)	100時間後輝度 (cd/m^2)
実施例11	1	8	7800		5800	5400
12	3	8	7000		5500	5300
13	5	8	8200		6500	6300
14	6	8	8400		6600	6200
15	9	8	5600		3600	3400
16	10	8	5200		3500	3100
17	12	8	6300		4700	4400
18	13	8	6700		5000	4800
19	18	8	4800		3200	2900
20	20	8	4900		2900	2600
比較例7	比較1	8	240		160	発光せず
8	比較2	8	350		220	50
9	比較3	8	320		250	発光せず
10	比較4	8	670		560	140
11	比較5	8	150		110	20
12	比較6	8	380		340	40

[0155] The component of the structure shown in [example 21] drawing 3 was created.
[0156] On the same transparent conductive support substrate as an example 1, the chloroform solution of the compound shown with the following structure expression was formed by 20nm thickness with the spin coat method, and the hole transporting bed 5 was formed.
[External Character 101]



[0157] The condensed multi-ring compound (weight ratio 1:50) shown by the compound furthermore shown with the following structure expression and instantiation compound No.1 was formed by 20nm thickness with the vacuum deposition method, and the luminous layer 3 was formed. The degree of vacuum at the time of vacuum evaporationo formed 1.0x10 to 4 Pa, and a membrane formation rate on condition that 0.2 - 0.3 nm/sec.
[External Character 102]



[0158] Furthermore, aluminum tris quinolinol was formed by 40nm thickness with the vacuum deposition method, and the electronic transporting bed 6 was formed. The degree of vacuum at the time of vacuum evaporationo formed 1.0x10 to 4 Pa, and a membrane formation rate on condition that 0.2 - 0.3 nm/sec.
[0159] Next, the metal layer membrane with a thickness of 150nm was formed with the vacuum deposition method on the above-mentioned organic layer as cathode 4 using the vacuum evaporationo ingredient which consists of aluminum and a lithium (lithium concentration 1 atom %), and the component of the structure shown in drawing 3 was created. The degree of vacuum at the time of vacuum evaporationo formed 1.0x10 to 4 Pa, and a membrane formation rate on condition that 1.0 - 1.2 nm/sec.
[0160] Thus, when the ITO electrode (anode plate 2) was used the obtained component, the positive electrode and the aluminum-Li electrode (cathode 4) were used as the negative electrode and the direct current voltage of 8V was impressed, the current flowed for the component with the current density of 7.3 mA/cm2, and green luminescence was observed by the brightness of 13000 cd/m2.
[0161] Furthermore, when current density was maintained at 5.0 mA/cm2 under nitrogen-gas-atmosphere mind and the

electrical potential difference was impressed for 100 hours, 8400 cds/m2, and brightness degradation were small 100 hours after initial brightness 9500 cd/m2.

[0162] [Examples 22-25] instantiation compound No.1 Replaced with, and instantiation compound No.2, and 15, 17 and 21 were used, and also the component was created like the example 21, and same assessment was performed.

[0163] A result is shown in a table -3.

[0164] Replaced with [examples 13-18 of comparison] instantiation compound No.1, and comparison compound No.1, and 2, 3, 4, 5 and 6 were used, and also the component was created like the example 21, and same assessment was performed. A result is shown in a table -3.

[0165]

[A table 3]

表－3

例No.	例示化合物 No.	初期 印加電圧 (V)	輝度 (cd/m^2)	耐久 (電流密度) 5.0 mA/cm^2	初期 輝度 (cd/m^2)	100時間後 輝度 (cd/m^2)
実施例21	1	8	13000		9500	8400
22	2	8	11000		9200	8100
23	9	8	8600		6800	6000
24	15	8	9600		7700	6900
25	17	8	9900		9000	8300
比較例13	比較1	8	250		180	発光せず
14	比較2	8	440		310	40
15	比較3	8	350		250	発光せず
16	比較4	8	870		690	70
17	比較5	8	430		370	20
18	比較6	8	330		260	発光せず

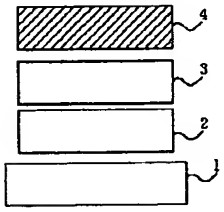
[0166]

[Effect of the Invention] applied voltage with the organic light emitting device above low like explanation using the condensed multi-ring compound shown by the general formula [I] -- high -- brightness luminescence is obtained and it excels also in endurance. The organic layer containing especially the condensed multi-ring compound of this invention is excellent as an electronic transporting bed, and excellent also as a luminous layer.

[0167] Furthermore, it can create using vacuum deposition or the casting method, and creation of a component is also comparatively cheap and can create the component of a large area easily.

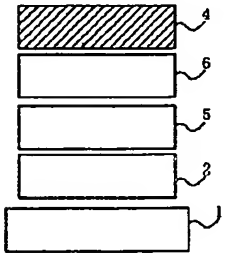
[Translation done.]

Drawing selection drawing 1



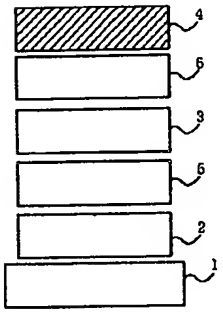
[Translation done.]

Drawing selection drawing 2



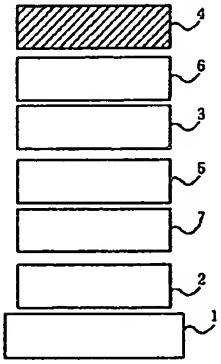
[Translation done.]

Drawing selection drawing 3



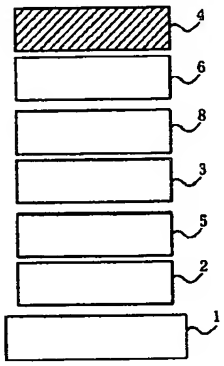
[Translation done.]

Drawing selection drawing 4



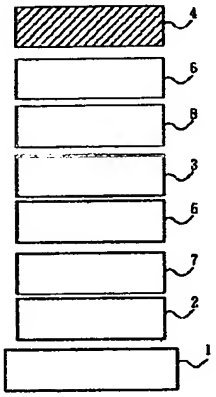
[Translation done.]

Drawing selection drawing 5



[Translation done.]

Drawing selection drawing 6



[Translation done.]